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LUMBINI DEVELOPMENT TRUST 1985

MASTER DESIGN

for the

LUMBINI GARDEN

(draft)

KENZO TANGE & URTEC

FEBRUARY 1981

Appendix (I)

Summary of Cost Estimates (April 1981)
(Unit=Million or x 1000,000)

1.	Symbolic Pavilion Type No.1 4 units	$ 0.300*	
2.	Symbolic Pavilion Type No.2 4 units	$ 0.570	
3.	Colonnade	$ 1.500*	
4.	Central Link Bridge	$ 0.500*	
5.	Bridge Linking Lumbini Centre Typical Blocks 2 units	$ 0.400*	
6.	Small Bridge Crossing Central Canal 4 Locations	$ 0.250*	
7.	Lumbini Centre Typical Block 8 units	$14.800	
8.	Museum	$ 2.100	
9.	Auditorium	$ 4.000*	
10.	Library, Research Institution, Residences, Dormitory	$ 5.900*	
	Sub Total	$30.320	
11.	Meditation Centre 2 units	$ 0.461	
12.	Pilgrim Accommodation	$ 0.329	
13.	High School	$ 0.281	
14.	Middle Class Accommodation	$ 0.479	
15.	Camping Ground	$ 0.062	
	Sub Total	$ 1.612	
16.	Sacred Garden	$ 2.638	
17.	Central Canal	$ 2.634	
18.	Monastic Zone Land Development	$ 5.606	
19.	Metalled Roads	$ 4.353	
20.	Service Roads	$ 1.051	
21.	Archaeological Office and Utility Block	$ 0.100	
	Sub Total	$ 6.282	
22.	River Improvement and Diversion	$ 0.400	
23.	Power Supply	$ 3.300	
24.	Telecommunications	$ 0.7100	
25.	Water Tower and Underground Reservoir	$ 0.507	
26.	Water Supply and Distribution	$ 0.510	
27.	Sewage and Drainage	$ 1.206	
	Sub Total	$ 6.633	
	Grand Total	$54.847	

Excluding Construction Supervision Fee and Furniture.

* Based on the cost estimate of similar type of construction.

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FORWARD

The Master Plan for the Development of Lumbini was approved by the H.M.G. Lumbini Development Committee in March 1978.

According to that Master Plan, the four major zones—the Lumbini Centre and the Cultural Centre, the Central Link, the Monastic Zones, and the Sacred Garden—are to be placed within the 1.6 x 4.6km site.

Administrative, Touristic, Commercial, and Cultural Facilities will be compactly arranged in the Lumbini Centre and this complex will for the main gate to the Sacred Garden.

The Central Link will serve as the approach way to the Sacred Garden along which worshippers may prepare themselves spiritually for entrance into the garden.

The Sacred Garden is the central aspect of the entire project, as it is a memorial to the Lord Buddha who was born there.

The Monastic Zones are placed in the groves along both sides of the Central Link in the form of clusters of Monastic Enclaves.

Other subsidiary facilities are palced separately on the North side of the site—the location which is farthest from the Sacred Garden.

The major planning policies for this project have been determined by the Master Plan. The plans explained in this report represent further developments of the concepts found in the Master Plan. Discrepancies with the Master Plan found in this report take precedence over the Master Plan, but all other matters are to remain as they are in the Master Plan.

All construction of roads leading from Bhairawa to Lumbini Garden as well as those along the boundaries of the project area has been completed. Also all planting of tree and shrubbery in the south side area of the Bhairawa—Taulihawa road including the lines of trees along both sides of the Central Link. Archaeological excavations and investigations in the area around the Ashoka Pillar are in the process of being carried out, as is the construciton of the circular levee in the Sacred Garden. One of the three deep wells planned for this site has been installed and a greater volume than had been expected is being produced.

In Kathmandu, a national engineering design team of the following firms under the auspices of the H.M.G. Lumbini Development Committee with the assistance of United Nations Development Programme has been formed for the purpose of creating detailed construction execution documents.

S.N.Rimal Engineering and Architects Pvt.Ltd.	(structural and engineering work for main buildings)
Technical Interface Pvt.Ltd.	(design of subsidiary buildings)
TSA Engineering and Architects	(site work and landscaping)
MECA Engineering Services	(river improvement and levee)
CEMAT Consultants Pvt.Ltd.	(electric power supply)
Central Engineering Consultants	(telecommunications)
NEPALCONSULT Pvt.Ltd.	(water supply, sewage and drainage)

At the same time, Kenzo Tange & URTEC, the firm commissioned to create the Master Plan, has been further commissioned to create the physical design for all major buildings and landscaping of the project.

In order to complete the planning stage as quickly as possible, work was carried out simultaneously in both Tokyo and Kathmandu with close communication maintained at all times. Designs created in Tokyo were sent to Kathmandu one after another where formation of working drawings was immediately carried out. On the other hand, for purely technical problems, studies were carried out simultaneously by Nepalese firms in accordance with the Master Plan. We sincerely believe that no praise could be too much for the technical know-how and the good faith of the various consulting firms involved in the success of this joint effort.

This report is an atttempt to summarize the studies carried out in cooperation with the national engineering design team and to place emphasis on explanation of the basic concepts of the project.

1. GENERAL ITEMS

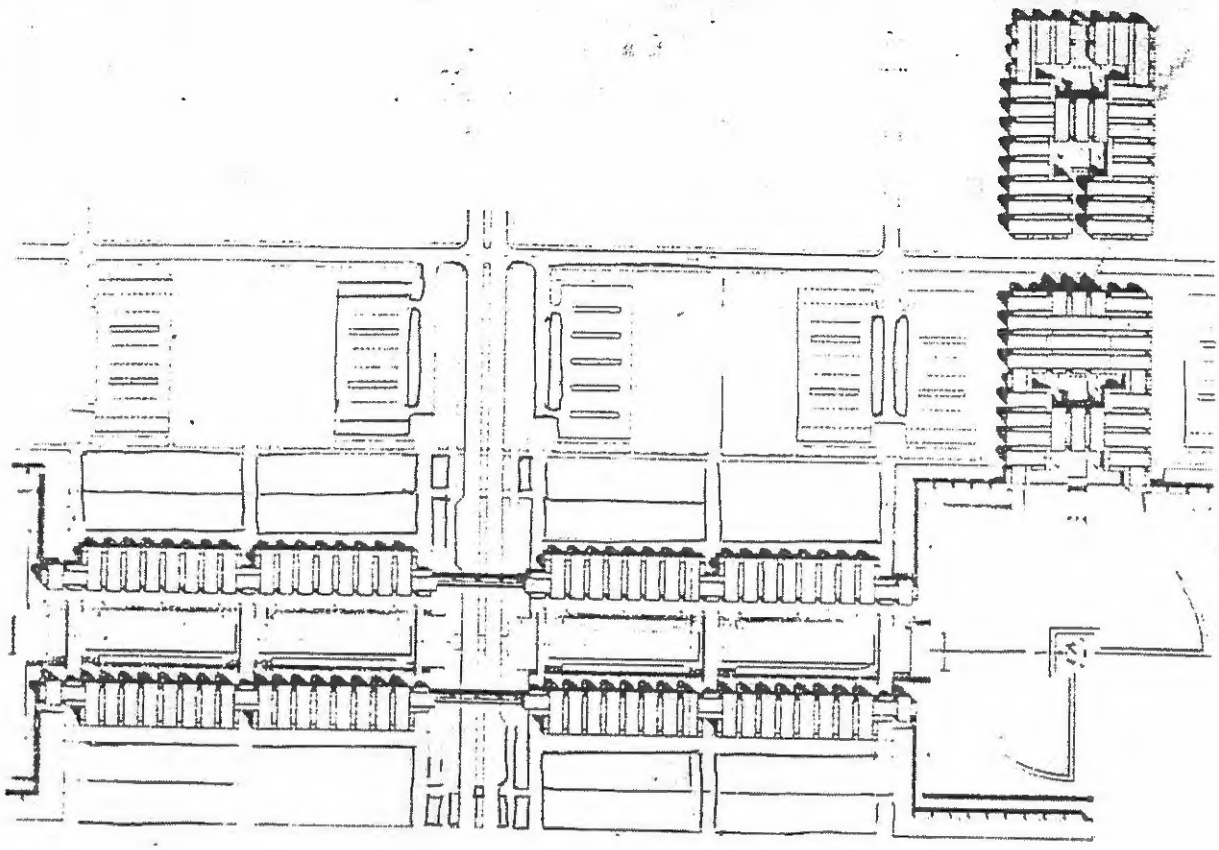
According to the Master Plan, the Lumbini Centre is to contain such general necessary facilities as a garden maintenance office and a tourist information offfice as well as such public facilities as restaurants, shops, a telephone office, a police office, and banks for monetary exchange, while the Cultural Centre is to provide such facilities for cultural activities as a museum, an auditorium, a library, and research institution and accommodation for professors and scholars.

In order to create inter-relationships among these various functions and activities, and to organize the various movements and activities of visitors, an integrated arcade space has bee introduced into the plan.

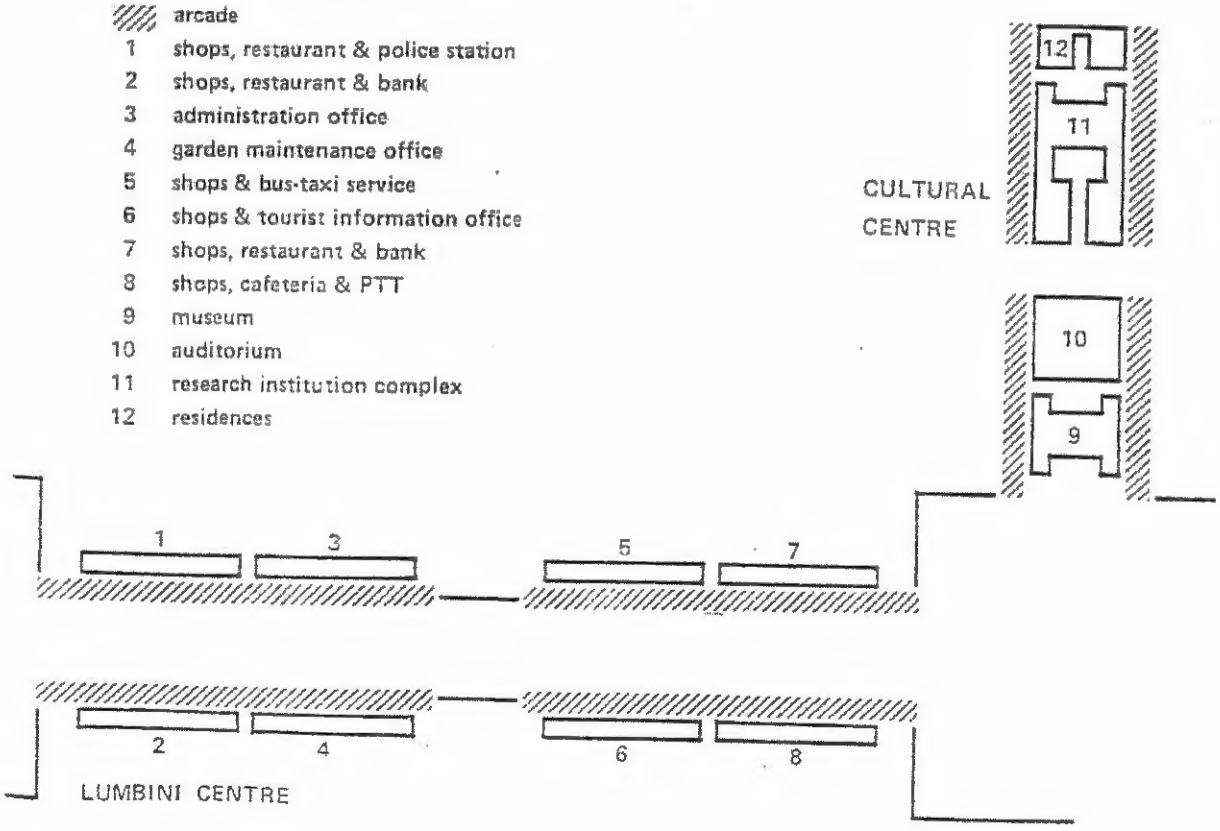
In Lumbini Centre, an arcade is thought desirable along both sides of the Central Canal with the necessary facilities placed behind these arcades. In the Cultural Centre, two parallel arcades are planned with the various facilities between them, thus forming inner courtyards.

The placement of buildings organized by these arcades will give the area sense of unity. This sense of unity will be further enhanced and clarified by the unified architectural style of the whole.

The high standard of architectural design, structure, and materials in this plan will afford great ease in design control in the training of craftsmen, in the actual construction process, and in the subsequent use flexibility of the buildings.



arcade
1 shops, restaurant & police station
2 shops, restaurant & bank
3 administration office
4 garden maintenance office
5 shops & bus-taxi service
6 shops & tourist information office
7 shops, restaurant & bank
8 shops, cafeteria & PTT
9 museum
10 auditorium
11 research institution complex
12 residences



LAYOUT OF BUILDINGS

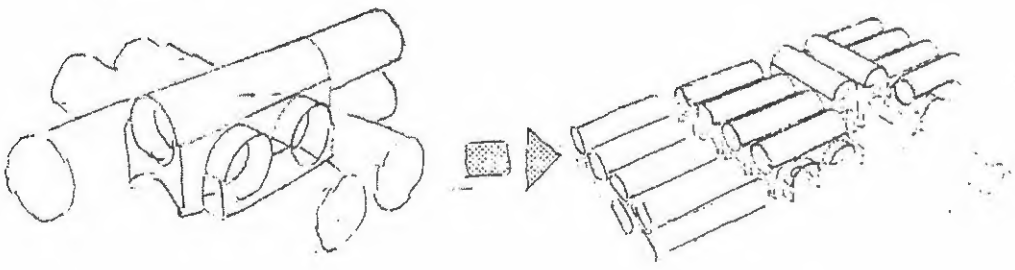
2 ARCHITECTRURAL SYSTEM.

Consideration of the memorial character of the buildings in the Plan, of the necessity to withstand long-term use in the futrue, and of local availability brought about the decision to use a brick structure throughout the entire project.

The structural style utilized in the extremely traditional method of placing barrel vaults on top of two parallel beams to form a series of arches. Round openings to placed at the both ends of the barrels vaults, and the radii of the vaults and the arches are kept the same throughout, resulting in the space structure system seen in the diagram below.

This system can be repeated in any direction. By unifying the radii of the vaults and arches, it is possible to standardize the construction of the structural body as well as the window frames for the open ends.

The outside radius of the barrel vault is 3m, and a 2m space is left open between a set of two barrel vaults. In functional terms, the six meter wide ground floor space covered by the arch can be used for shops and small offices, while the two meter open space between can be used for corridors, stairs, restrooms, and technical space. On the first floor level, quite broad space is available for public use, and arrangements have been made in accordance with the functions necessary.



EXTENSIBLE MODULAR SPACE

Brick size has been specially set for this project at the following measurements.

(L)240 x (W)115 x (H)53mm

Including a 10mm joint, on the horizontal plane, 4 x L or 8 x W constitutes 1m, and on the vertical plane, 12 x H is 76cm. This makes up the structure of a vetical module.

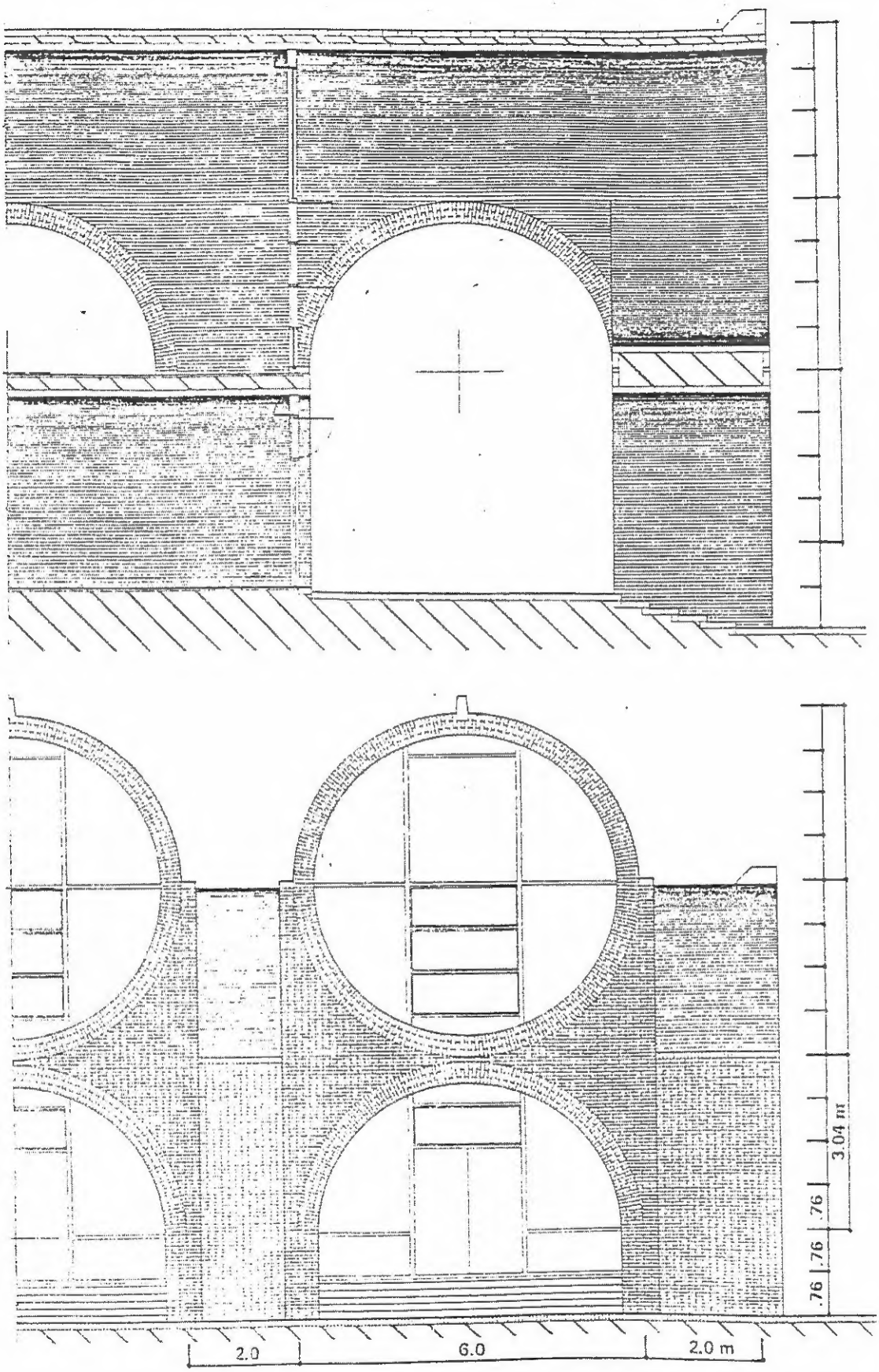
This vertical module has been set in accordance with the size of the barrel vault. the outside radius of the barrel vault measures 3m. Thus if an 8cm distance is left between cylinders placed on top of each other, the vertical distance between the center of two cylinders becomes 608cm. The 76cm vertical module was eatablished by dividing this into eight equal parts.

The vertical module is utilized in the architectural design and the landscaping design. Since this module is made up of twelve layers of bricks, it can be divided into 2, 3, 4, or 6 equal parts. This same type of measurement is utilized throughout all architectural and landscape elements. For instance:

76 x 8	= 608cm	lighting
76 x (3+1/2)	= 266	wall in Monastic Zone
76 x 3	= 228	door hight
76 x (1+3/4)	= 133	position of switch on walls
76 x (1+1/4)	= 95	parapet of staircases and drinking fountains
76 x 1	= 76	dust-bin, size of window
76 x 3/4	= 57	parapet of bridge, mooring
76 x 1/2	= 38	bench
76 x 1/4	= 19	steps (interior)
76 x 1/6	= 12.7	steps (exterior)

Various project ground levels have been established for this project, and they have also been set in terms of this same 76cm module.

One Brick — 240 ~ 250
one and Half — 365 ~ 375
Two Brick — 490 ~ 500



TYPICAL BRICKWORK

3. BUILDINGS IN THE LUMBINI CENTRE

The Lumbini Cenre is made up of eight blocks lined up behind the two parallel arcades.

These blocks consist of two levels each. On the ground floor there are six spaces that measure 6 x 8m. One side opens directly on to the arcade and the opposite side is connected to the service corridor. There is comparatively broad space on the first floor, and public approach is possible from both ends. This first floor space can be connnected to the ground floor service corridor by stairs when necessary.

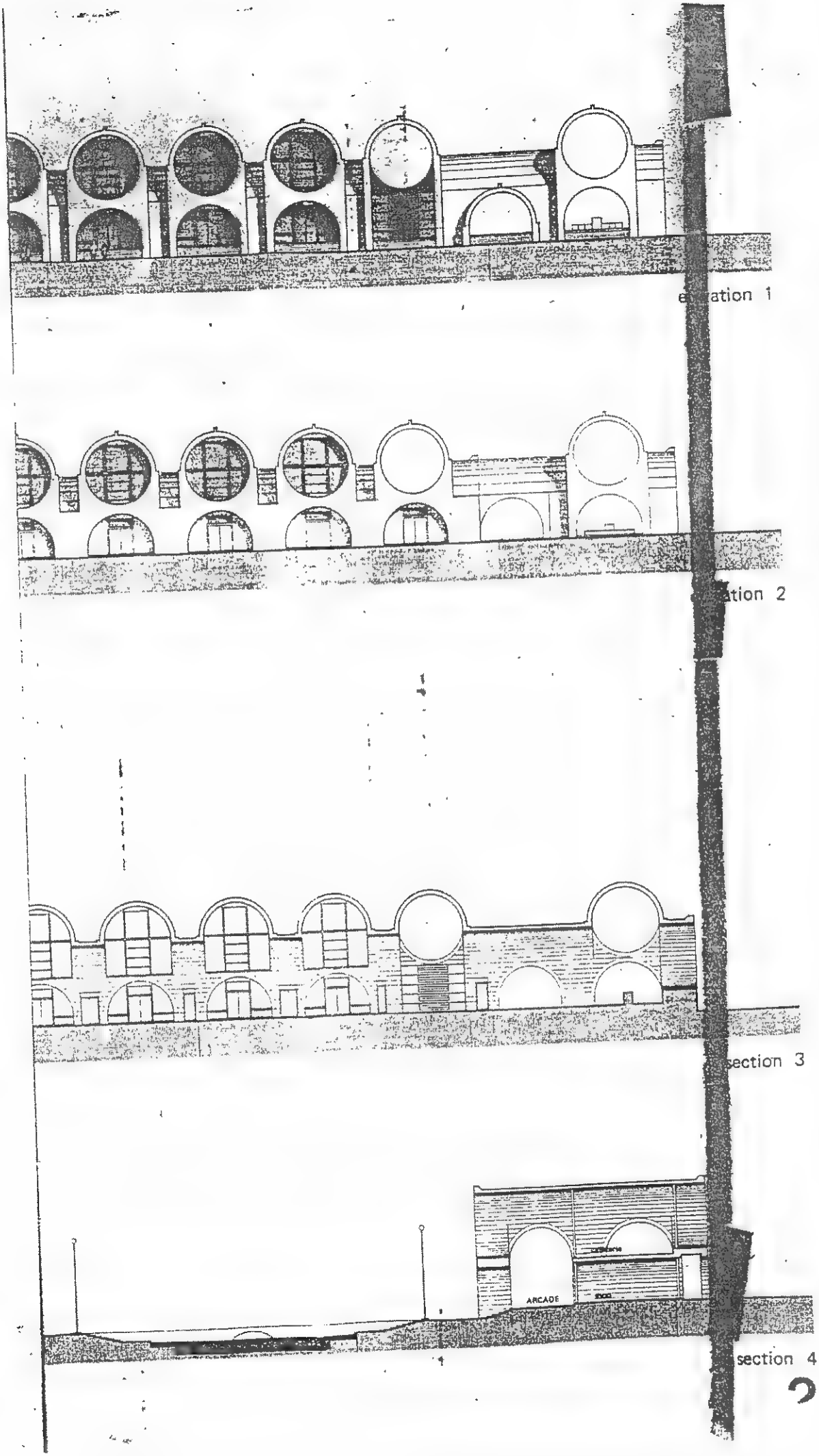
The two blocks facing each other situated just north of the Bhairawa–Taulihawa road make up the Garden Administration Centre. Large space have been provided on the first floor for use as office space, director's rooms, and public relations spaces, while the ground floor is occupied by partitioned spaces for type-copy rooms, drafting rooms, archives, etc.

Just to the south of the Bhairawa–Taulihawa road is the Tourist Centre. The first floor of a pair of facing blocks is occupied by the tourist information centre and the transportation service office. Within these first floor spaces are broad public waiting spaces where displays of information can be held. The ground floor is occupied by shops.

The first floor of the remaining four blocks at the north and south ends of the Lumbini Centre buildings is occupied by subsidiary public facilities each such as a restaurant, a cafeteria, a telephone office, a police station, or small banks for monetary exchange. The ground floors are occupied by shops.

BUILDINGS IN LUMBINI CENTRE – NORTH

BUILDINGS IN LUMBINI CENTRE – SOUTH

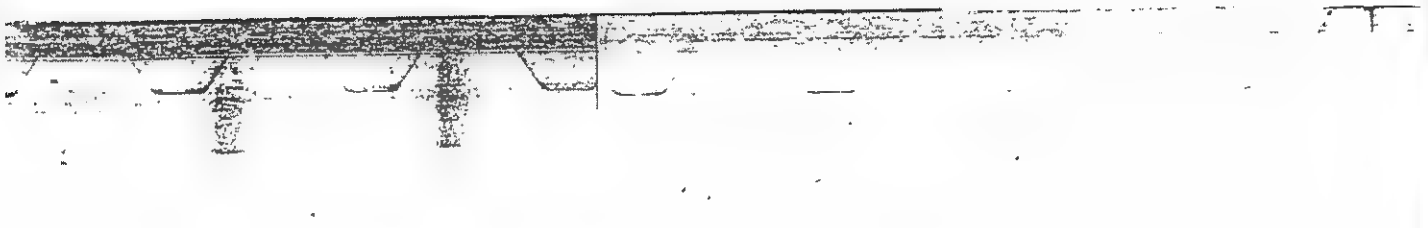

ARCADE

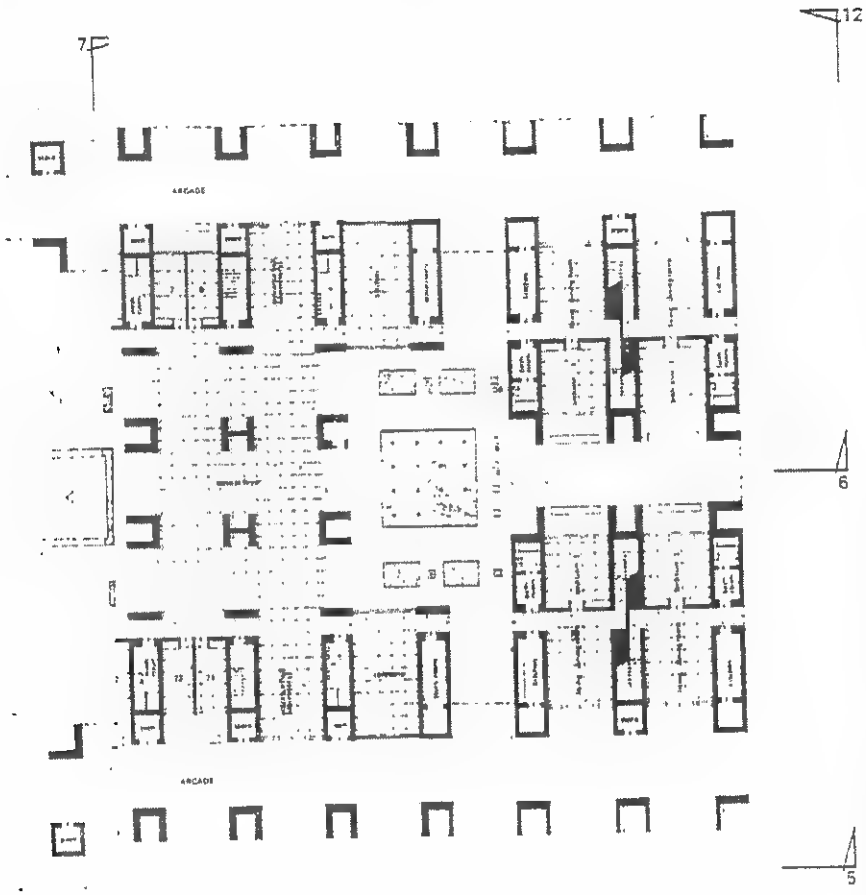
4. BUILDINGS IN THE CULTURAL CENTRE

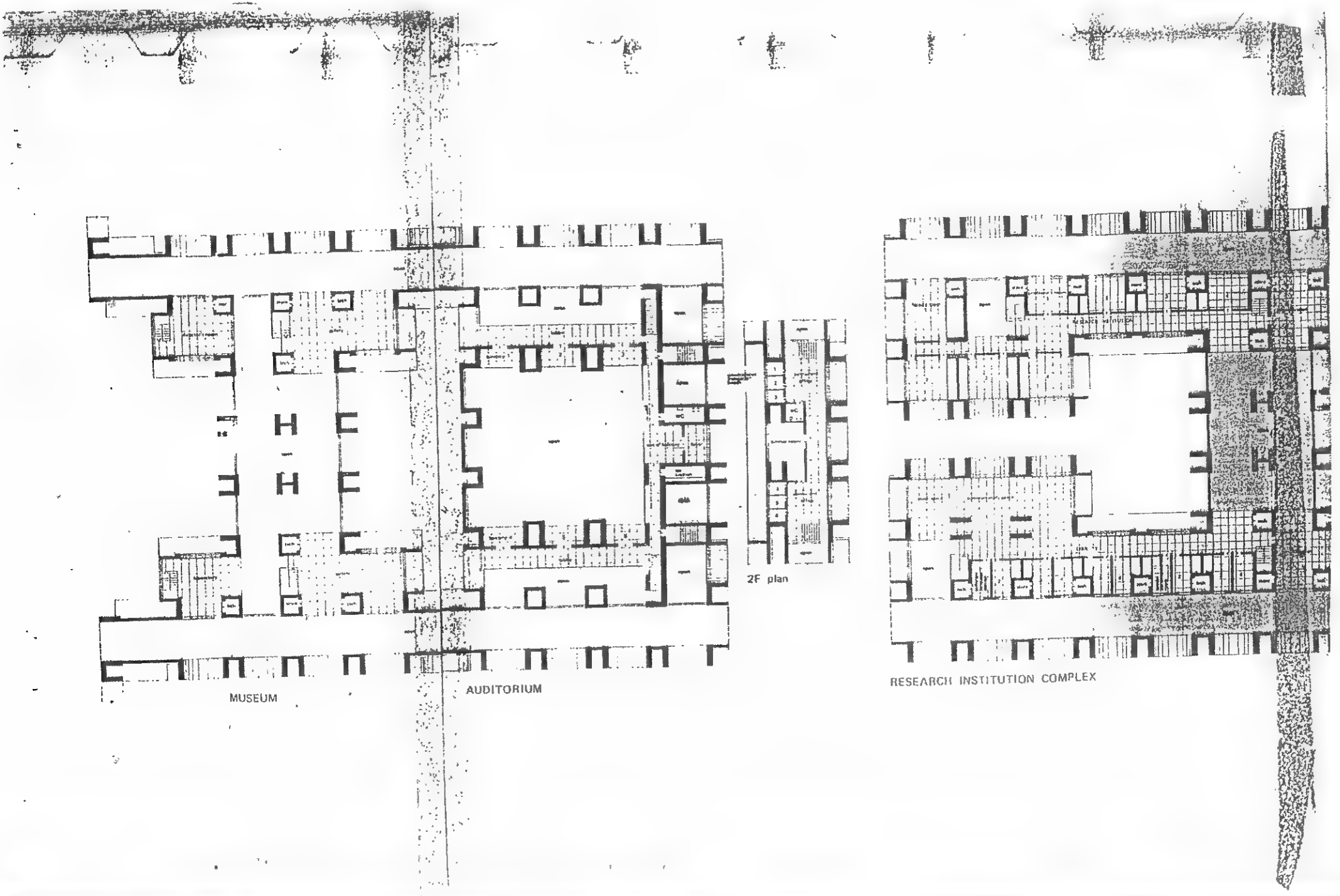
The building of the Cultural Centre located nearest the Lumbini Cenre is the Museum. This building is made up of a 14 x 22m central exhibition hall with a high ceiling surrounded by four mezzanine spaces and the ground floor sapce beneath them. The two mezzanine spaces on the west side and the ground floor space beneath them is utilized as spaces for administration, workshop and laboratory for archaeological research. All remaining spaces are public oriented space. The various articulated spaces of the central hall, the mezzanine sapces, and the low ceiling ground floor spaces are used for different types of specialized exhibitions.

Behind the museum is the Auditorium. The center of this bulding is a 420 seat multi-purpose hall. Considering the fact that this hall will be used for national and inter-naitonal congresses, a comparatively large space of 60 x 100cm per seat has been provided. In the back of this hall is a special balcony with annex facilities.
Also six balconies for the press and special observers have been provided on the side walls of the hall. The technical facilities of the auditorium are located in the upper back wall of the hall, including six simultaneous interpreter booths. The typical standardized architectural section of the project is expressed on the four walls of the hall, and acoustic considerations have been made in the brickwork design of those walls.

The third building of the Cultural Centre is the Research Institution Complex. The first floor is made up of a research institute containing lecture rooms that accommodate twenty five students each, and a library that contains a large common study room and small study rooms for the different language sections. The ground floor is a dormitory of twenty four single rooms. Also a block is placed on the east side that is made up of four independent professor's residences. This block is considered to be a part of the Research Institution Complex. In order to further enhance the special character of this complex in which the living quarters of professors and scholars as well as their research facilities are all in close contact with each other, a comparatively large space in the center of the complex has been provided in the form of a central foyer where family atmosphere meeting can be held.




7
12
6
5
ARCADE
ARCADE


MUSEUM
AUDITORIUM
2F plan
RESEARCH INSTITUTION COMPLEX

5. SALIENT TECHNICAL ASPECTS

Considerations must be made for the possibility of earthquakes at the Lumbini site. Among the available records, reports of at least two earthquakes have been found, the intensity of which was 7 to 7.5 on the Modified Medicali intensity scale. This is equal to 7 or 8 on the MSK scale and 4 or 5 on the Japanese seismic intensity scale. The seismic center is the same for both of the former earthquakes, about 40km from the project site.

In consideration of the public and memorial character of the main buildings of Lumbini, a seismic design load for structural analysis has been proposed and approved by the Nepalese structural engineer which is far higher than the general standard for this area at a horizontal seismic coefficient of 0.135g.

The wind load at the site can also not be ignored. Toward the end of the annual dry season, the site is hit by rather strong sand storms. Considerations have been made for a wind velocity of 45m per second in the calculations for the design load.

The standardized building structure has quite a rigid structural frame, and the barrel vault of the roof is mounted on a base that is extremely difficult to deform. Special considerations have been made to guard against the danger of bricks coming lose and falling off the walls. For this purpose it is necessary that the bricks used for the surface finishing be set prior to concrete pouring as much as possible in order that they may form frameworks.

Since the buildings of the Lumbini Centre and the Cultural Centre are built as continuous structures over a long distance, joints have been placed at appropriate spots to effect as much structural separation as possible.

Trenches are to be installed beneath the arcade along with the construction of the foundation. Ducts, plumbing and piping will be installed in these trenches, and water and electric lines will be brought up through these trenches to supply the 2m zones between the vaults in the various buildings, and when necessary, they will be further brought through the 2 x 2m thechnical spaces to the upper floors.

Concerning the Museum and the Auditorium, central air conditioning will be effected by means of a fun-coil unit system.

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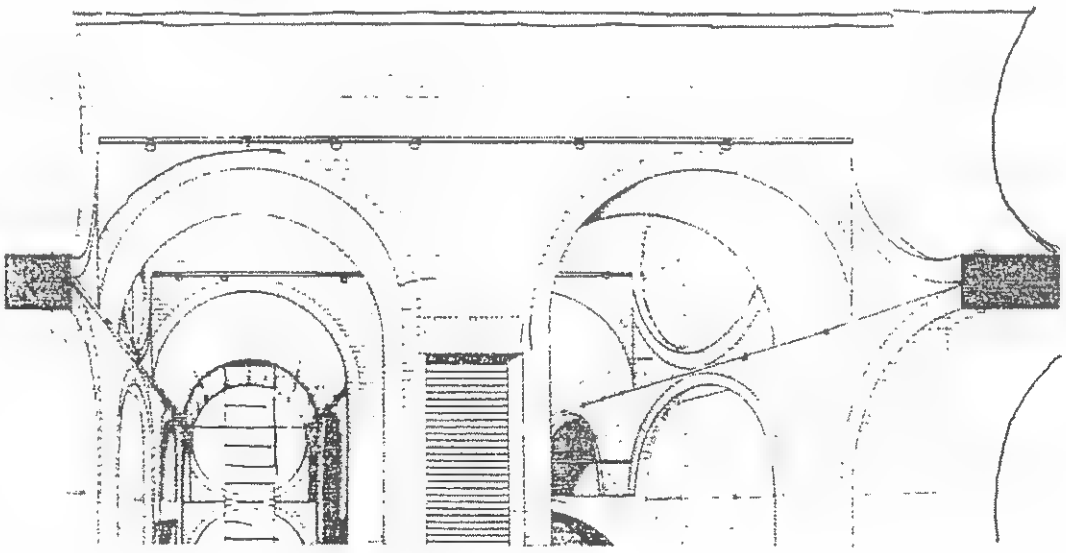
Concerning the other buildings, each of the two spaces coverd by a cylinder will be fitted with an air conditioning package unit. These package units will be installed in the 2 x 2m technical space. Sprinklers will be installed along the crest of the roof barrel vaults. These will be for use in both keeping the buildings clean as well as for the lowering of the internal room temperature during the hot season by means of evaporation.

In the upper part of each window sash system, a horizontal slit is to be installed. This slit will be kept open at all times except during the sand storm season to provide natural ventilation. A mechanical air exhaust system will be installed in the toilets and the kitchens. Their ventilation ducts will lead directly to the roof through the 2 x 2m technical space.

Special care has been taken in designing the interior lighting system of the buildings as an important element of the interior space design. On the ground floor level, linear type fluorescent lights will be installed along the crest of the ceiling vault, and on the first floor, the same type of fittings will be installed along the cylinder spring line that makes up the ceiling.

In the museum exhibition space, an exposed linear lighting fixture system with incorporated conduits will be used in place of fixed lighting fittings to accommodate various types of exhibitions.



LIGHTING IN THE MUSEUM

Concerning finishing materials, brick will be used generally for all exterior and interior building surfaces, and brick tile will be laid on the floors. Concerning the toilets, suspended ceilings will be used as an exception to the general design rule in order to make the ceilings lower, and the walls and floors will be finished with glazed tile. The interiors of the storerooms and technical spaces will be finished with mortar. Steel sash has been indicated for use in the working drawings for the window frames of openings due to consideration of material costs at the site. However, aluminum sashes have the important advantage of requiring no maintenance after installation. It is thought that aluminum sashes may become feasible in case a comparatively large number of buildings are constructed systematically. If this situation develops, it will be necessary to reconsider this matter.

6. SCHEDULE OF FLOOR AREAS

LUMBINI CENTRE

		GF	1F	2F	Total
Block 1	RETAIL (including tea kitchen, circulation space etc.)	528	—		528
	RESTAURANT	—	228		228
	POLICE STATION	—	120		120
2	RETAIL	528	—		528
	RESTAURANT	—	228		228
	BANK	—	120		120
3	ADMINISTRATION OFFICE	528	348		876
4	GARDEN MAINTENANCE OFFICE	528	348		876
5	RETAIL	528	—		528
	BUS–TAXI SERVICE	—	348		348
6	RETAIL	528	—		528
	TOURIST INFORMATION OFFICE	—	348		348
7	RETAIL	528	—		528
	RESTAURANT	—	228		228
	BANK	—	120		120
8	RETAIL	528	—		528
	CAFETERIA	—	180		180
	PTT OFFICE	—	168		168
arcade		3,648	—		3,648
miscellany		960	576		1,536
total		8,832	3,360		12,192m²

CULTURAL CENTRE

MUSEUM	956	400	—	1,356	
AUDITORIUM	1,280	344	184	1,808	
RESEARCH INSTITUTION COMPLEX					
RESEARCH INSTITUTION	296	612	—	908	
LIBRARY	168	612	—	780	
DORMITORY	1,316	—	—	1,316	
PROFESSOR'S RESIDENCES	520	304	—	824	
(total research institution complex	2,300	1,528	—	3,828)	
arcade	2,196	—	—	2,196	
miscellany	156	64	—	220	
total	6,888	2,336	184	9,408 m²	

PART II
LANDSCAPING

1. GENERAL

The Lumbini Garden is made up of the following four important zones.

- Lumbini Centre and Cultural Centre
- Central Link
- East and West Monastic Zones
- Sacred Garden

Each of these areas have their own unique character. The landscaping plan should reflect visually the different character of each area. Thus four diffienent basic landscape policies have been established.

It was decided in the Master Plan that the Garden would be made up of simple natural materials such as brick, water, trees, etc. Brick has been used as the standard material throughout the entire project for not only buildings but also for all park furniture such as benches, dust-bins, drinking fountains, and moorings.

The present study is centred to establish several different landscaping methods utilizing these strictly limited design elements.

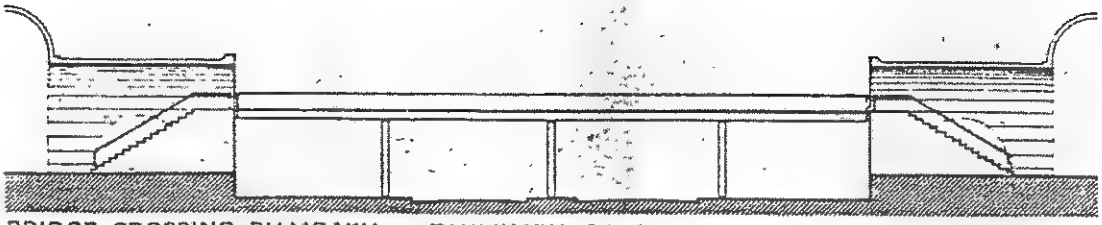
2. LUMBINI CENTRE AND CULTURAL CENTRE

Commercial, touristic cultural, administrative, and other such activities will coexist in this area. Along with the canal and arcade, park furniture will be put to active use here as well. It will be developed as a richly varied space appropriate as a starting point for pedestrians who begin their pilgrimage to the Sacred Garden from this point.

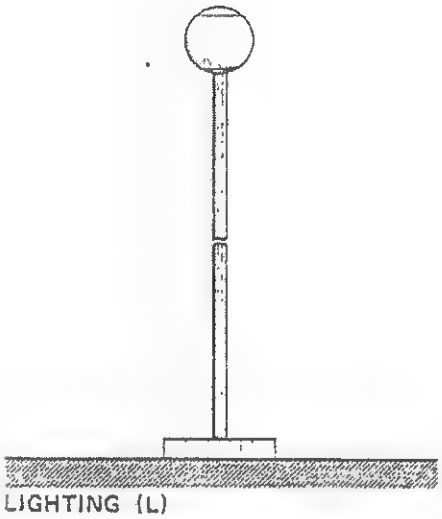
In order to answer the demands for safety on a technical level and for a clear view all the way to the Asnoka Pillar for pedestrians, the canals and ponds have been placed on a lower level than the actual ground level while the pedestrian walkways have been raised above the actual ground level in a series of differing project ground levels. These levels have been connected by stairs and ramps. These elements serve to further accentuate the character of the area through human activity.

Walls made up of extensions of the standardized arche structure found in the 2m wide zones of the standardized architectural system structure plan have been considered to link the buildings of the Lumbini Centre with those of the Cultural Centre as well as to delineate the space around the north and south ponds. In the Cultural Centre, court-yards have been placed on both sides of the central exposition hall of the Museum and the central foyer of the Research Institution Complex to provide calms spaces for scholars and visitors appropriate to a cultural centre.

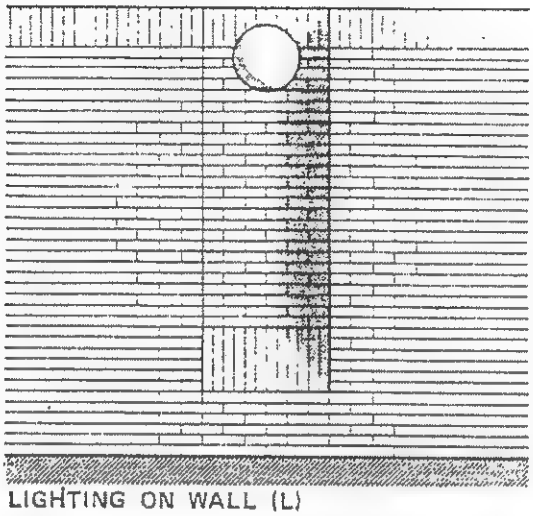
Trees will not be planted around the buildings of the Lumbini Centre and the Cultural Centre. This is for the purpose of providing an unobstructed view of these buildings from a distance, and to strengthen their impression as a gate to the Lumbini Garden for visitors who arrive via the Bhairawa—Taurihawa road.



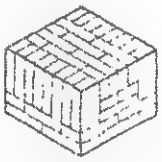
BRIDGE CROSSING BHAIRAWA – TAULIHAWA ROAD



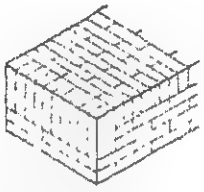
LIGHTING (L)



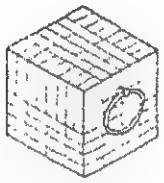
LIGHTING ON WALL (L)



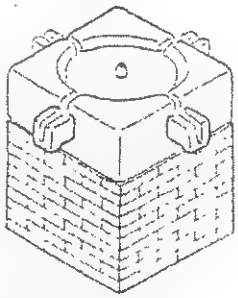
BENCH (B)
50 x 50 x 38 cm



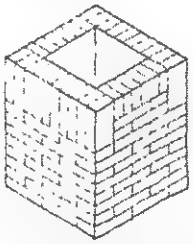
BENCH (B)
62.5 x 38 cm
(length : variable)



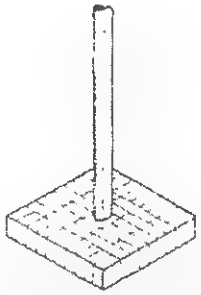
MOORING (M)
50 x 50 x 57 cm



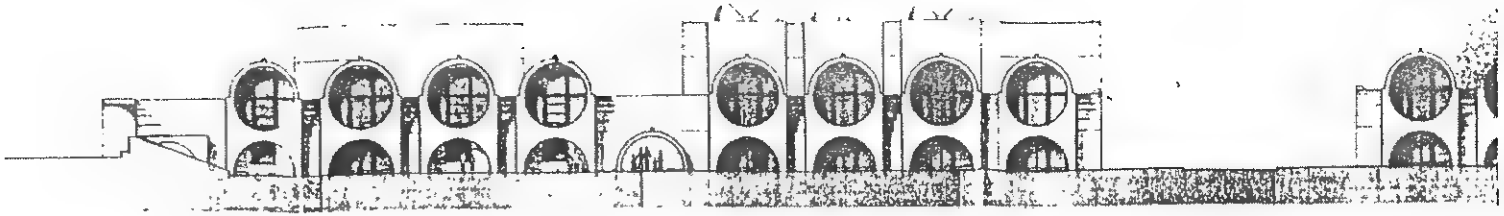
DRINKING FOUNTAIN (DF)
75 x 75 x 95 cm

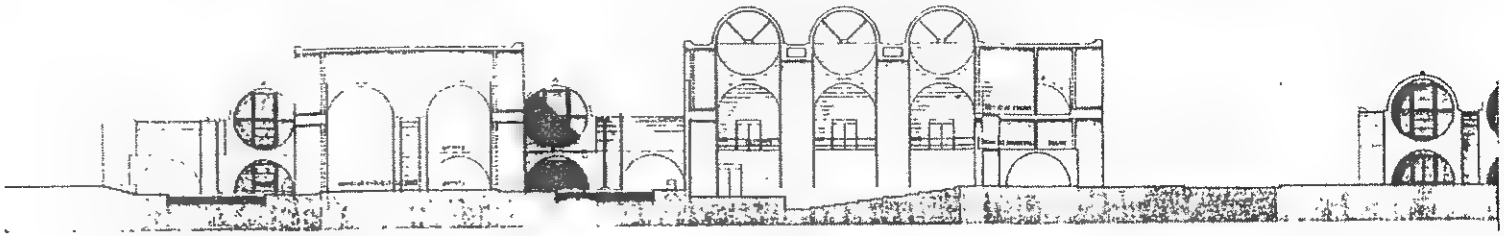


DUST – BIN (DB)
62.5 x 62.5 x 76 cm

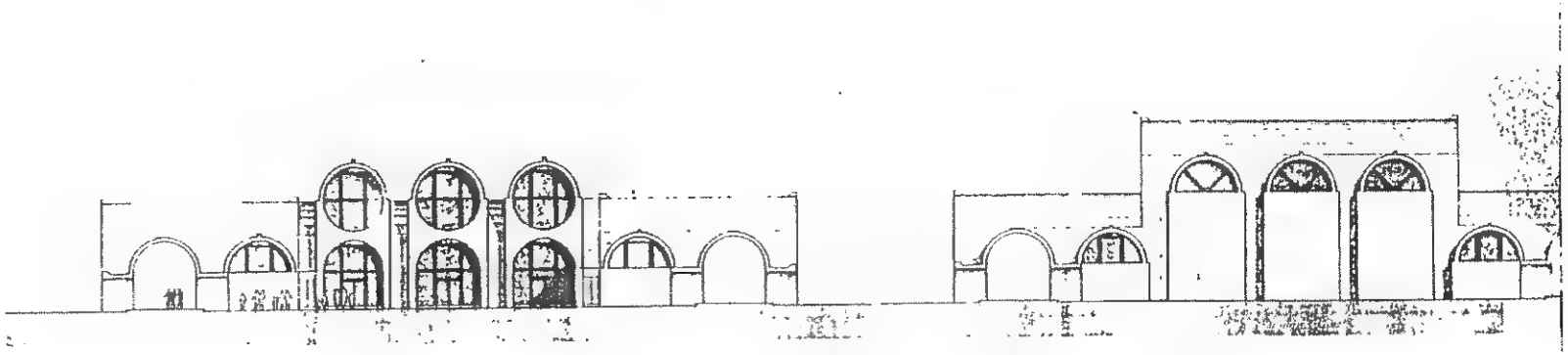


BASE OF LIGHTING
62.5 x 62.5 x 12.7 cm

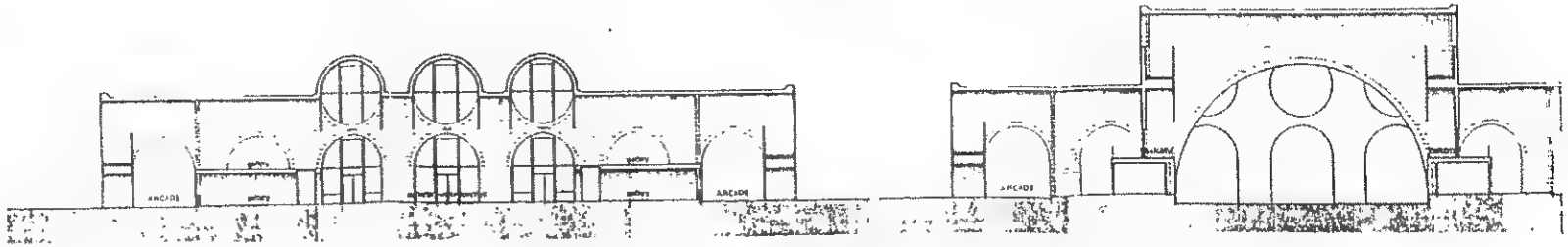




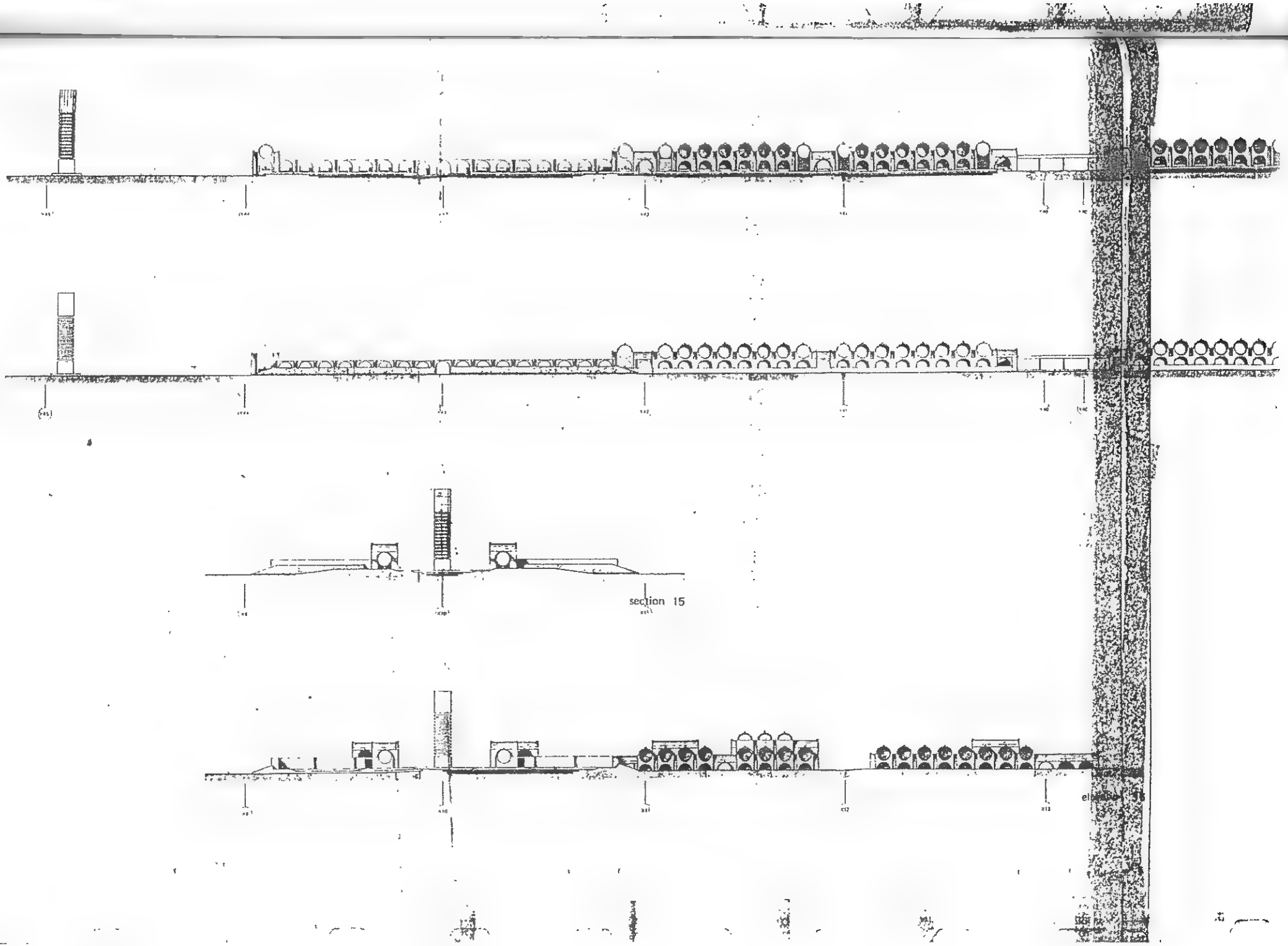
MUSEUM AUDITORIUM RESEARCH INS



elevation 7



section 8


section 15

3. CENTRAL LINK

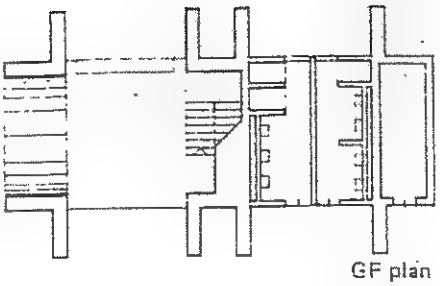
The Central Link is a 64m wide, 1.5km long corridorlike space for circulation.

This link is tie between the Lumbini Centre and Cultural Centre — a human scale space full of activity made up of various buildings and landscaping elements — and the Sacred Garden — with its archaeological remains and its natural view making up the religous dimension. As visitors pass through this link, its design will help them prepare psychologically for their visit to the Sacred Garden.

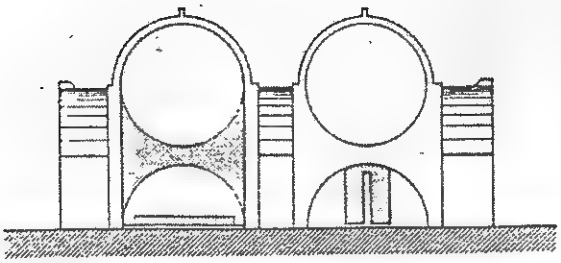
The canal that runs along the middle of the Central Link will be provided with boats as a means of transportation for the aged and the handicapped. The boats are also to be thought of as a moving landscaping element within the Central Link. The character of this space will be further enhanced by the continuous movement of people moving through it. Rhythmic composition is considered appropriate to this space. One element in the creation of the sense of rhythm here is the lines of trees along the side of the canal to be planted at 16m intervals. Also sitting spaces at the rate of one to every five trees and made up of benches, dustbins and lighting are planned. And the entire length of the Central Link is to be further broken up into three sections of equal length by Boat Station 1, Lumbini Square 1, Lumbini Square 2, and Boat Station 4, from north to south.

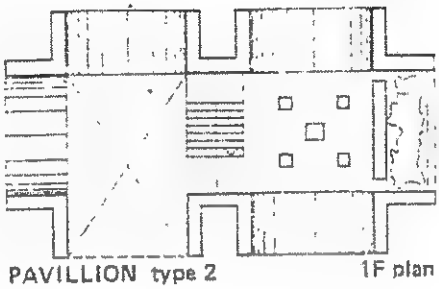
Each of the Lumbini Square are to be centered around a symbol sculpture. Thus including the ones to be placed in each Monastic Plaza, a total of four symbol sculptures are planned. Because of their importance, it is desirable that they be created through the participation of internationally recognized sculptors.

The Boat Station in Lumbini Square is to be installed between the twin bridges that span the canal. These bridges have been designed in such a way that they do not obstruct the view through the Central Link. A pair of stone drinking fountains inside the Lumbini Square indicate the approach to the Monastic Zone.

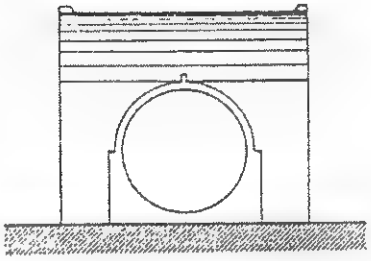


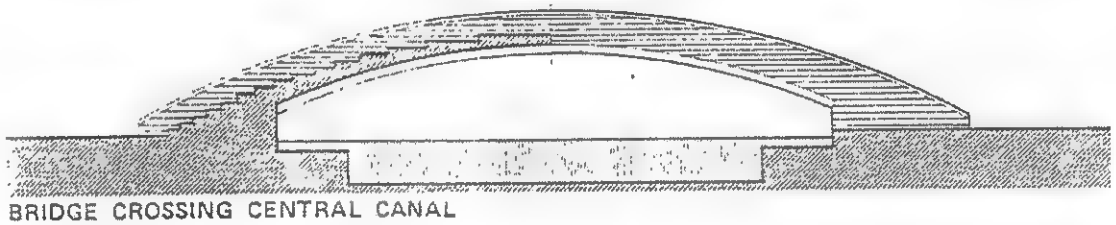
GF plan



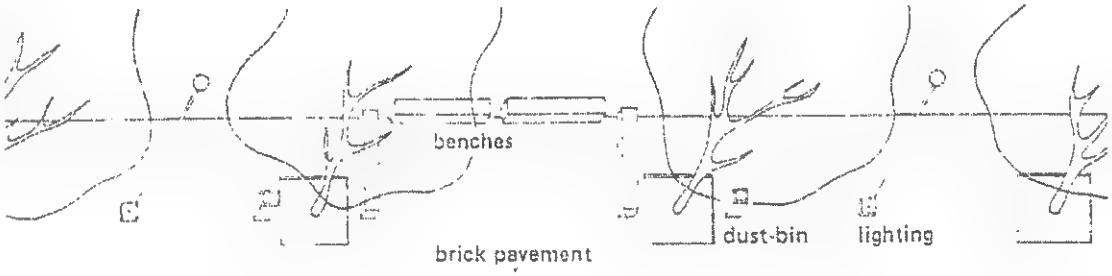


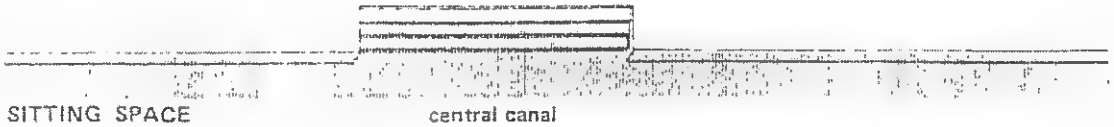
PAVILLION type 2 1F plan





BRIDGE CROSSING CENTRAL CANAL





4 MONASTIC ZONES

The Monastic Zones spread out within the groves along both sides of the Central Link. The monastic Zone on the west side of the Central Link is made up of monastic enclaves for the Mahayana Sects, while that on the east side of the Central Link is for the Hinayana Sects.

Buildings of various styles will coexist inside this zone in the future. This is due to the fact that each enclaves will most likely be filled with buildings that reflect the traditional buddhist style of the mother country of the sect that builds it. Thus landscaping that will unify the various styles that might appear here is being considered.

A space known as a Monastic Plaza which is to be made up of a circular or semi-circular set of steps is to make up the centre of each Monastic Zone. As the centre of the Monastic Zone, this plaza will have a high density of public activity. A symbol sculpture will be placed in the centre of each plaza.

Pedestrian paths will stretch out in the four directions from these Monastic Plazas. The symbol sculpture will always be visible from these paths. A number of courts will be placed along these paths. These courts will serve as front approaches to the various monastic enclaves, and they are called Entrance Court.

The Monastic Plaza, the main pedestrian paths and the Entrance Courts serve as a trunk to link the various buildings of the monastery. Also the 2.66m high walls that mark the boundaries of the monastery and face these spaces, as well as the lighting system installed in those walls, and even the alignment of the bricks have all been integrated into the unified design plan. Also the landscaping of the Entrance Court has been absolutely standardized. Each Entrance Courts is planted with the medium size trees of the same species, and only the species of trees differ with each Entrance Court to give them individual identity.

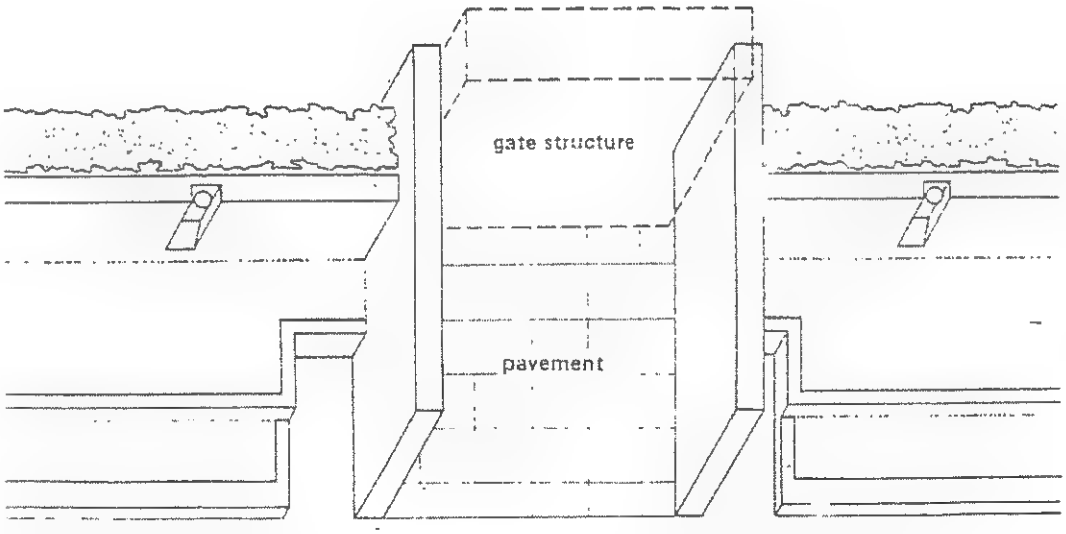
It is desirable that hedges be planted along the inside of the walls that mark the boundaries of the monastic enclaves that reach as high as the walls themselves. This is for the purpose of creating a buffer between the surrounding public areas and the enclave itself as well as to improve the appearance of the inside of the enclave.

The following regulations have been imposed upon buildings to be built in the Monastic Enclaves.

— Inside the Monastic Enclaves, buildings may not be constructed within set zone near the Monastic Plaza, the main pedestrian paths, and the Entrance Courts.

— Except for special permission that may be granted for towerlike structures, the height of all buildings is limited to three stories.

— A freely designed gate is to be allowed in the inner space between the two parallel standardized brick walls. The material for the pavement in front of the gate may be freely chosen to maintain harmony with the design of the gate.



MAIN GATE OF MONASTERY

elevation 18

5. SACRED GARDEN

Remains of such religious architecture as monasteries and stupas have accumulated around the Ashoka Pillar over the centuries, the bulk of which were constructed during the Mauria period. Also about three hundred meter southwest of the Pillar is a smooth mound of three meters in height. It is thought to be the remains of a support and supply village for the religious complex around the Ashoka Pillar. The position of the ancient road that connected the village and the Ashoka Pillar has also been quite certainly determined.

Another road stretches out to the southeast from the Ashoka Pillar. It is thought to have been an ancient regional trunk road. At the edge of this road, near the Telar River, two old wells have also been discovered.

Archaeological investigations of the entire area are being vigorously carried out by the H.M.G. Department of Archaeology, but the actual extent of the artifacts buried underground is still not known.

Also artifacts that have been uncovered, especially foundation bricks that have lost their adhesive qualities from being buried for so many years, are buried once more during the rainy season in order to protect them from further decay after investigations have been made on them.

One of the purposes of this garden development is to put these interesting artifacts on display for visitors, but in order to accomplish this, the following important measures must be taken and decisions must be made.

1) Through excavation investigations, the total picture of urban structure and its transitions must be known.
2) Decisions must be made for each area concerning which level of artifacts are to be shown to the public as there are several layers of remains in each area.
3) New bricks of the same size of the old ones must be made to replace the old decayed ones to reconstruct the old structures.

The ground level in the immediate area around the Ashoka Pillar will be lowered to the Mauria period foundations in order to reconstruct the conditions of the time in which the Pillar was constructed.. In other words, it is desirable to remove around

1.5m of the present ground surface. This will make it possible to make a combined display of mauria period buildings along with that discovered beneath the Maya-Devi Temple.

Concerning the remains of the ancient village, there is very little possibility that remains of important structures will be found. It is thought that the housing construction style of that time was little different that that of today, and that the materials had very little time resistant qualities. It is desirable that after archaeological investigations are completed, some sort of landscaping be carried out to show above the ground the unique village pattern of this area to develop it as a public space. Also the ancient road pattern should be reconstructed.

The Sacred Garden is made up of the archaeological field, a group of manmade lakes and a circular levee link that surrounds them. This structure will serve the following two functions.

1) The levee and the manmade lakes will serve to isolate the sacred area. The levee makes it impossible to see the outside from the inside. Also the visitors will thus be made to feel that the normal surrounding activities are far removed from them as they pass along the long bridgelike corridor between the manmade lakes to arrive at the sacred area.
2) This structure also serves as a protection against floods. At present, this area is often covered with flood water after intensive rainfall. When the levee linkage is completed, the archaeological site only will be protected from further flooding. Rain that falls inside the levee will be stocked temporarily in the manmade lakes until the flooding in the surrounding area recedes.

The levee and the lakes have been placed in the Master Plan for the purpose of carrying out the above roles. Therefore, their present positions are tentative, and their final positions cannot be determined until the archaeological maintenance area is finaly designated.

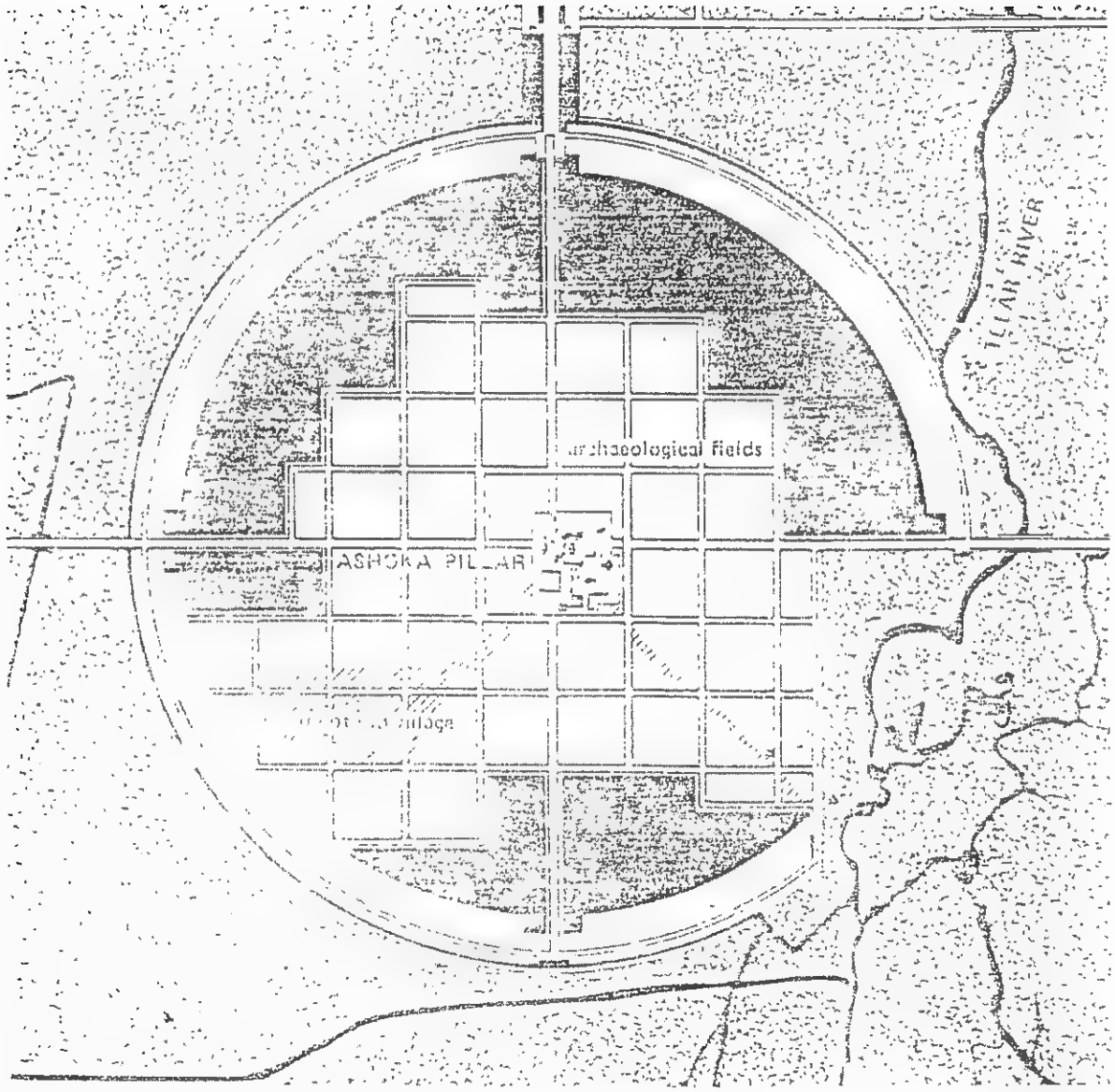
It is difficult to determine the size of the surface area of the manmade lakes under the present conditions. However, for landscape effect purposes, the broader the lakes, the better. Also in terms of water disposal, there will certainly be a limitation on how small the lakes may be due to the need for stocking rain water and seepage inside the levee link during floods. In case this smallest limitation on the size of the lakes cannot

be attained, water disposal will have to be carried out mechanically in order to maintain the lake water surface level below that of the archaeological field. Several testing lakes have been planned for the purpose of making investigations to determine the volume of seepage water and other matters of the actual conditions of the area.

The circular levee link, a part of the manmade lake, and the 80m grid road are at present under construction.

It is thought that at the present stage, it is not appropriate to proceed with further detailed designing. Factors unknown at present may well appear to influence the design as the excavation investigations and hydrological surveys proceed. And since these investigations will require a great deal of time to complete, it will become necessary to provide temporary arrangements for tourists and pilgrims who visit the area in the interim. Through repeated panel meetings of professionals in relation to technical investigations and studies, and experience in landscaping arrangement with plants and the lowest possible limit of park furniture, the final landscaping plan will naturally come into being.

In any case, the circular levee link and the 80m grid road pattern will determine the structure for the entire plan, and thus if construction is continued without the introduction of any new structures, a landscape appropriate to the Sacred Area will automatically emerge.



SACRED GARDEN

PART III
CIVIL ENGINEERING

1. FLOOD CONTROL

About one-third of the south end of the project area, including most of the archaeological site of the Lumbini Garden, is flooded several times during the rainy season. At present, there is no clear information concerning the flooding period or the water flow system. Due to the lack of geographical and climatological data, it is not possible to proceed with sufficient scientific research on these matters.

A certain amount of data useful in studies of these matters has been obtained through the questioning of residents concerning their past experience. By tracing the area which they say has the greatest floods on a map, it has been found that the flood water level reaches to +100.00m. They say that the floods reach as far as the base of the Ashoka Pillar which means that the level here is also +100.00m.

The present studies were carried out under the hypothetical conditions of a tolerance flood level of +100.00m.

Water level surveys are being systematically carried out at several points on the rivers in the site. Through these surveys, the changes in water flow volume throughout the year will be obtained. These figures, along with the results of the surveys on rainfall volume will provide a detailed estimate of the flood dangers in the area. In case these results show a flood danger level that exceeds the tolerance flood level of +100.00m mentioned above, it will become necessary to carry out improvements on the lower reaches of the rivers outside the project area to increase their water disposal efficiency to lower the flood water level.

Countermeasures have been considered to protect the various areas of the project from damage at a flooding level of +100.00m.

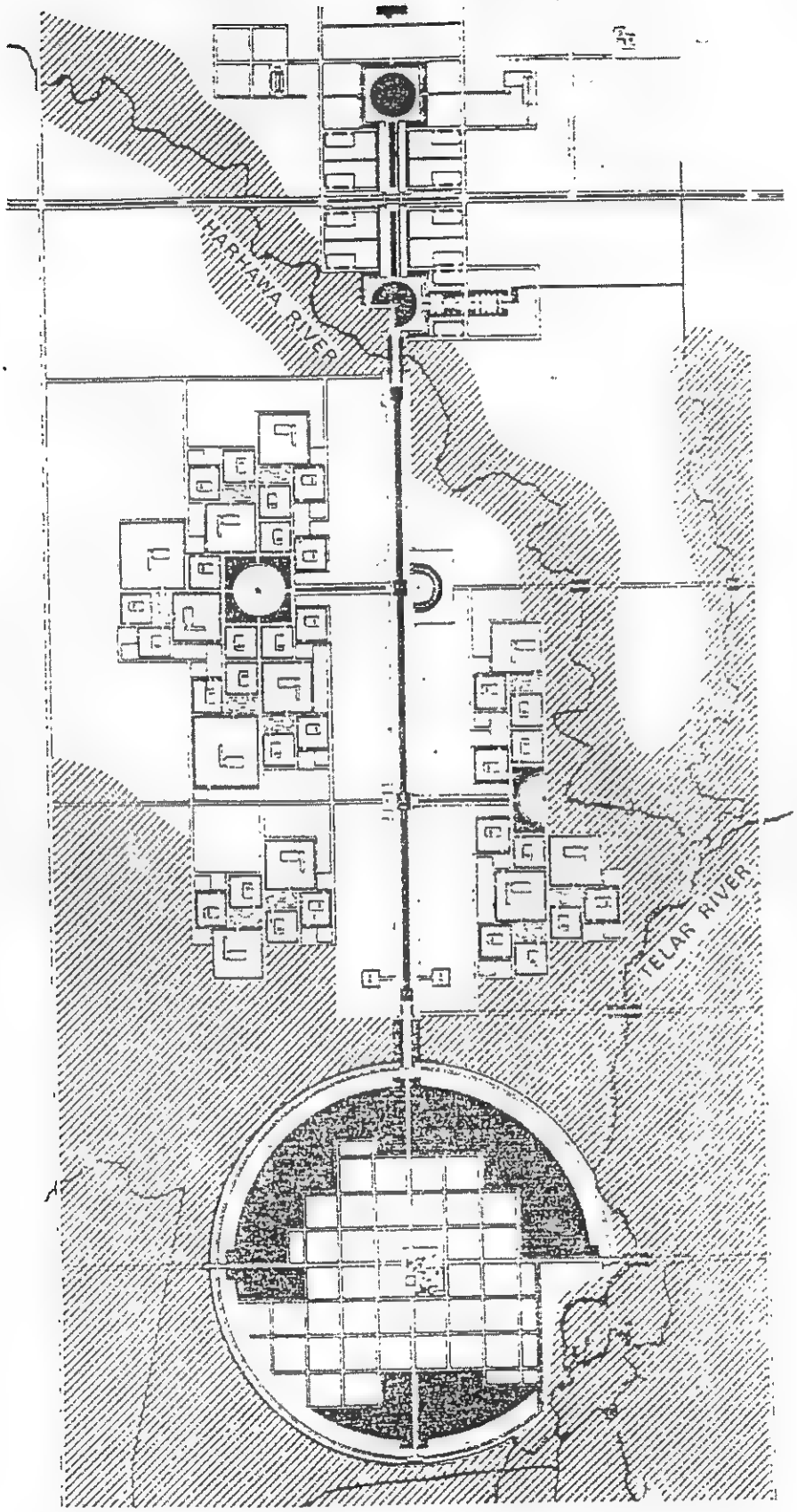
The archaeological layers in the Sacred Garden are quite low. Thus considerations have been made to surround the entire area with a levee to reach up to a level of +101.3m to keep out all flood water. The ground level of the Monastic Zones, the Central Link, and the Cultural Centre have been maintained at +100.75m for the purpose of protecting against the invasion of flood water. A somewhat higher ground level would be safer, but it would involve too much ground work. Thus the ground level has been kept at the lowest possible level for safety. Since it is believed that there will not much flood damage in the other forest area, it has been left in its present condition.

The above is the flood countermeasures for the south side of the project area, but concerning the Harhawa River that flows across the project area at an oblique angle, other considerations have been made. Fortunately there is already quite a lot of detailed data available concerning this river.

The Harhawa River flows across the point where the Lumbini Centre and the Central Link meet, and calculation of the drainage capacity at this point based on a rainfall return period of 100 years shows that the water level reaches +100.60m. By short-cutting and widening the bottle neck of the lower branch of this river and carrying out improvement work at various places, this water level can be appreciably lowered. This will bring it down close to the tolerance flood level of +100.00m found in the southern area. The lower base level of the bridge that links the Lumbini Centre and the Central Link has been set at +100.75m.

The basin of the Harhawa River is limited in size by a natural embankment. Thus even at flood times, its width does not exceed 200-300m, and there is no record of its overflowing into the surrounding area. In order to utilize this natural water disposal system, the least possible improvement has been made on this river. In order to avoid impeding the flow of water unnecessarily, the bridges on the service roads to the East Monastic Zone and the Sacred Garden that must be built over the Harhawa River and the Telar River are to be of a submergable type that will sink under the water at the time of floods. Even if traffic over these bridges is thus cut off during the limited flooding period, it will not cause any serious problems.

The flood countermeasures described above are passive measures, but they are realistic, and it is thought that they will completely protect functions from flood water. This solution by means of passive measures has the distinct advantage of involving no attempt to alter the flood pattern of the surrounding area outside the project area for its construction.



INUNDABLE AREA

From the viewpoint of scenery, it has been decided that all piping and wiring will be laid under the ground. In the case of the Lumbini Centre and the Cultural Centre, water supply pipes, electric cables and telephone cables will be laid inside the trench made for that purpose under the arcade. Along the Central Link, electric cables and telephone cables will be laid under the ground in the 8m wide grasslands between the forest area and the brick paved walkway.

—Water Supply

It is calculated that the greatest daily use of water for the project area will be 770m^3. Water supplied from three deep wells will be stored temporarily in a 770m^3 underground tank, after which it will be pressurized in a 160m^3 capacity water tower from which it will be distributed to the various facilities through 40 to 250mm diameter pipes. This water tower has been designed as an important landmark. A water system control room to control the amount of water supplied from the wells and the amount of water supplied to the central canal will be built in the lower part of the water tower where also chlorine purification equipment, pumps and other control equipment will be installed.

—Electric Power Supply

The total projected power demand is 3340kw. The main receiving sub-station will be built in the forest near the Cultural Centre. Electric power will be supplied from this sub-station to twelve distribution sub-stations built at important positions in the project area by means of 11kv 3 core 16 mm^2 or 25mm^2 underground cable lines. The buildings for these sub-stations have been designed in the same style as the public facilities along the central link.

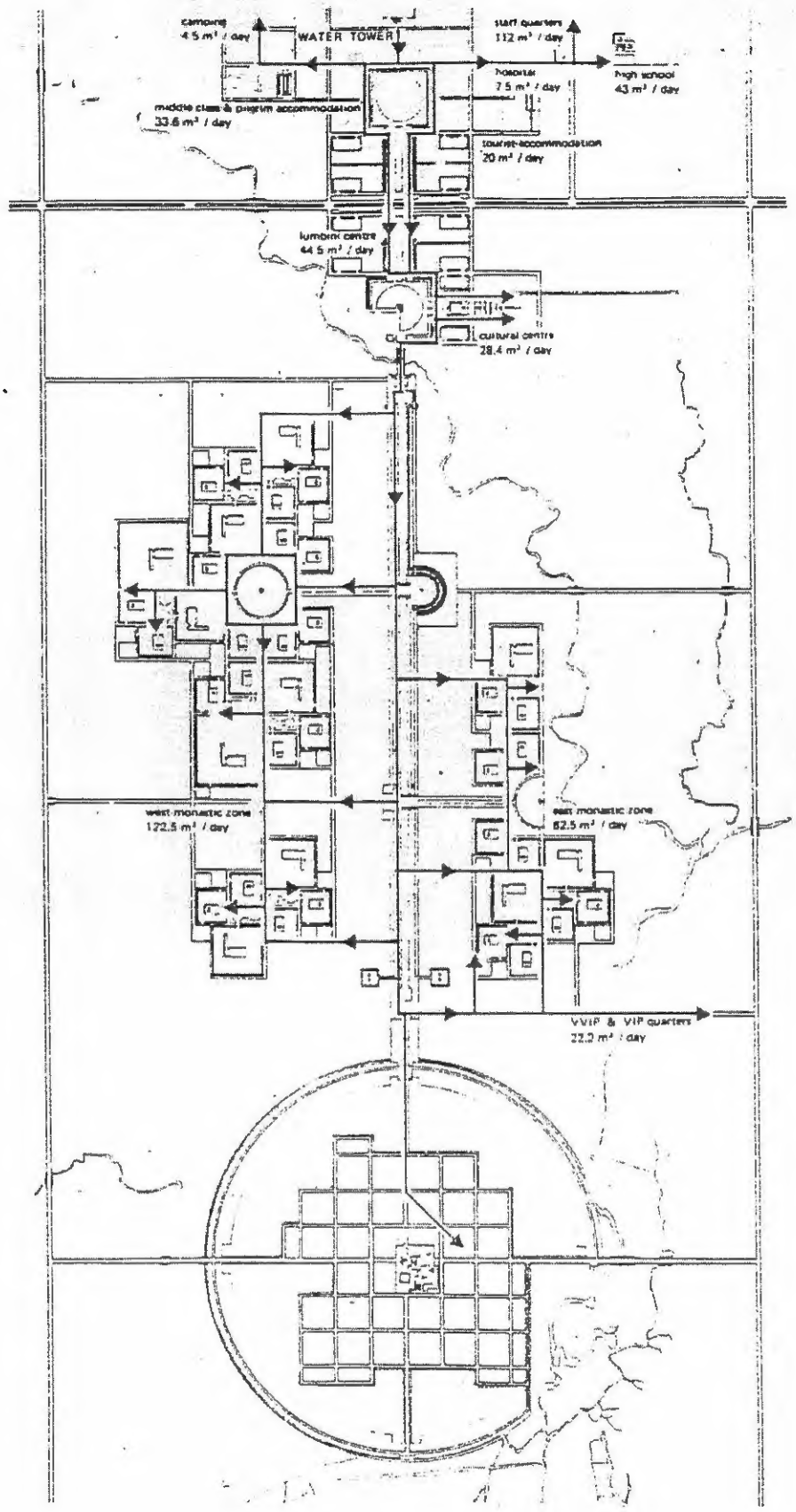
—Telephone System

The porject area is connected to Bhairawa, the nearest city, by VHF/ UHF radio link with a sufficient number of channels. The telephone exchange centre is to be installed in the Lumbini Centre. Its central switching equipment is a modern PABX system that makes possible extension to extension calls, operator to extension and vice versa, incoming external calls to extension via operator, extension to outside directly or through operator, call parking, etc. This highly advanced equipment for local, national and international communications is appropriate to the character of the Lumbini Garden as an international meeting place.

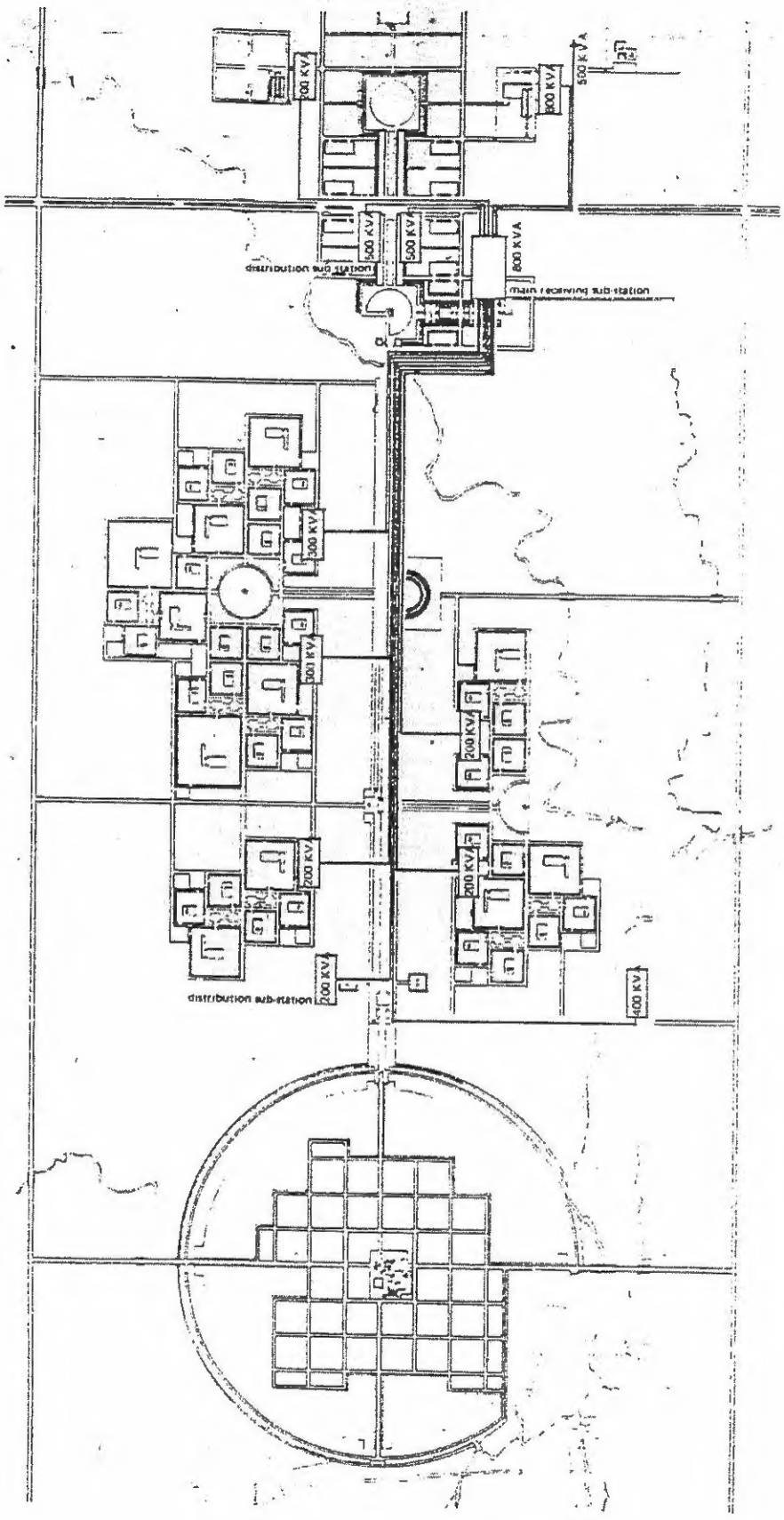
2. UTILITY NETWORK

The urban supply installation plan for inside the Garden has been made in accordance with the following projected facility capacities.

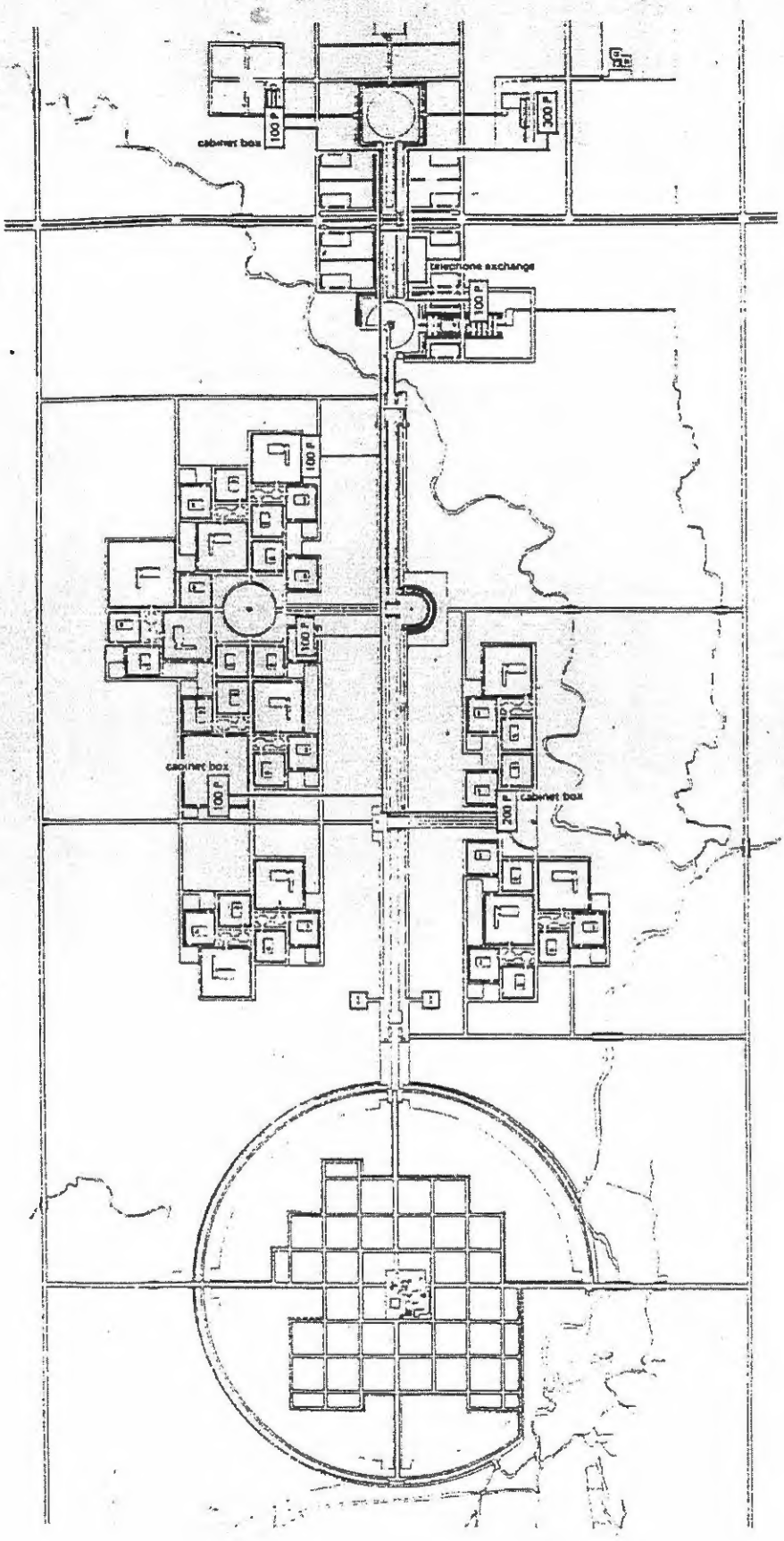
1) Tourist Hotel	100 beds
2) Middle Class & Pilgrim Accommodations	300 beds
3) Camping	100 persons
4) High School	
— Day Student	800 persons
— Hostel	100 beds
5) Hospital	15 beds
6) Lumbini Centre	
— Administrative Office	200 persons
— Other Facilities	350 persons
7) Cultural Centre	
— Day Visitors	1,000 persons
— Research Scholor's Accommodation	30 persons
8) West Monastic Zone	
— Monastic Enclaves	800 persons
— Day Visitors	250 persons
9) East Monastic Zone	
— Monastic Enclaves	400 persons
— Day Visitors	250 persons
10) Central Link	
— Day Visitors	500 persons
11) Meditation Centre	
— Accommodation	100 beds
— Day Visitors	500 persons
12) Staff Quarters	1,000 persons
13) V.I.P. Quarters	
— V.I.P.	30 persons
— Security Guards	100 persons
14) Public Facilities	20 nos.



WATER SUPPLY NETWORK



ELECTRIC POWER SUPPLY NETWORK



TELEPHONE CABLE NETWORK